

We claim:

1. A method for removing molten metal from a surface having molten metal adhering thereto, comprising applying a pressurized fluid to the adherent molten metal or to the surface such that the molten metal is removed from the surface; wherein the fluid is a non-wetting agent for the metal or carries a non-wetting agent for the metal.
2. The method of claim 1, further comprising retaining at least some of the non-wetting agent on the surface.
3. The method of claim 1, wherein the pressurized fluid is at an elevated temperature.
4. The method of claim 3, wherein the temperature of the fluid is at or near the melting point of the metal.
5. The method of claim 1, wherein the fluid is a gas selected from the group consisting of air, argon, nitrogen, hydrocarbon gas including methane and acetylene, and mixtures thereof.
6. The method of claim 1, wherein the fluid is a liquid selected from the group consisting of molten zinc, lead, tin, antimony, mixtures or alloys thereof, and salts.
7. The method of claim 1, wherein the fluid is a non-wetting agent for the metal.
8. The method of claim 1, wherein the fluid is a carrier for a non-wetting agent.
9. The method of claim 1, wherein the molten metal comprises aluminum or alloys thereof.
10. The method of claim 9, wherein the non-wetting agent is selected from the group consisting of boron nitride, barite, cryolite, fluorite, aluminum titanate, barium carbonate, wollastonite, calcium silicate, sodium chloride/potassium chloride mixture, flour, talc, graphite, coal, coke, and other carbon sources, and mixtures and combinations thereof.
11. The method of claim 10, wherein the non-wetting agent is carbon.

12. The method of claim 11, wherein the carbon is amorphous carbon.
13. The method of claim 10, wherein applying a pressurized fluid comprises applying the fluid stream from an acetylene torch to the adherent molten aluminum or to the surface.
14. The method of claim 10, wherein applying a pressurized fluid comprises applying pressurized air with entrained graphite or another carbon form to the molten aluminum or to the surface.
15. The method of claim 1, wherein the surface comprises thermocouple protection tubes, heater immersion tubes, riser tubes, dies/molds, engine components, turbine components, brakes, clutches, armor, electronic packaging material, thermal management material, or combinations thereof.
16. A method for cleaning a metal/ceramic composite material that has been formed by contacting a ceramic body with a molten metal and then removing the metal/ceramic composite from the molten metal, comprising applying a pressurized fluid to a surface of the metal/ceramic composite or to molten metal adhering to the surface of the composite to remove the adherent molten metal, wherein the fluid is a non-wetting agent for the metal or carries a non-wetting agent for the metal.
17. The method of claim 16, wherein the ceramic is selected from the group consisting of silica, mullite, titania ( $\text{TiO}_2$ ), titanium carbide ( $\text{TiC}$ ), zirconia ( $\text{ZrO}_2$ ), zirconium carbide ( $\text{ZrC}$ ), zirconium nitride ( $\text{ZrN}$ ), silicon nitride ( $\text{Si}_3\text{N}_4$ ), silicon carbide ( $\text{SiC}$ ), magnesium oxide ( $\text{MgO}$ ), titanium carbide ( $\text{TiC}$ ), aluminum nitride ( $\text{AlN}$ ), aluminum oxide ( $\text{Al}_2\text{O}_3$ ), titanium diboride ( $\text{TiB}_2$ ), analogous sulfides, and any other ceramic in which the non-metal portion has a greater affinity for the molten metal atoms than for the metal portion of the ceramic, and compounds and mixtures thereof.
18. The method of claim 16, wherein the metal is selected from the group consisting of aluminum, iron, nickel, cobalt, magnesium, titanium, tantalum, tungsten, yttrium, niobium, and mixtures and alloys thereof.
19. The method of claim 16, wherein the ceramic comprises fused silica and the metal comprises aluminum or an aluminum alloy.

20. The method of claim 19, wherein the non-wetting agent is carbon.
21. The method of claim 20, wherein applying a pressurized fluid comprises applying the fluid stream from an acetylene torch to the adherent molten aluminum or to the surface.
22. The method of claim 20, wherein applying a pressurized fluid comprises applying pressurized air with entrained graphite or another carbon form to the adherent molten aluminum or to the surface.
23. The method of claim 16, further comprising providing for continued removal of molten metal that exudes from the ceramic/metal composite material after contact of the ceramic body by the molten metal.
24. The method of claim 23, wherein continued removal of molten metal comprises retaining at least some of the non-wetting agent on the surface.
25. A method for removing molten metal from a surface having molten metal adhering thereto, comprising applying a non-wetting agent for the metal to the adherent molten metal or to the surface such that the molten metal is removed from the surface.
26. The method of claim 25, wherein applying a non-wetting agent comprises wiping the surface with a refractory cloth coated with graphite or powdered carbon.
27. The method of claim 25, further comprising retaining at least some of the non-wetting agent on the surface.
28. The method of claim 25, wherein the surface comprises a metal/ceramic composite.
29. The method of claim 28, wherein the metal/ceramic composite comprises fused silica, and the molten metal comprises aluminum alloy.